Birth weight and growth of New Zealand Thoroughbred foals

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Abstract

The success of the New Zealand Thoroughbred horse industry is highly dependant on the production of good foals. The birth weight of the foal, and its weaning weight, is closely associated with maternal factors, such as age, parity, size, and nutrition. Age is associated with endometrosis and limited placentation, which leads to a reduction in foal birth weight. Multiparous mares tend to produce larger foals than primiparous mares because of the priming effect that a first pregnancy has on the uterus.

Nutrition affects the size of the mare, which is positively correlated with foal birth weight. The size of the mare is positively correlated with birth size of the foal, and the birth weight of the foal is positively correlated with the mass, gross area and volume of the allantochorion, and the total area of foetomaternal contact. The information available on the maternal effects on foal birth weight is limited. This study attempts to improve our understanding of this relationship by examining data collected from New Zealand Thoroughbred mares, which are held on pasture throughout the year and may receive little supplementary feed during pregnancy.

Data were collected from 49 New Zealand Thoroughbred mares and their foals during the 2004 foaling season. Analyses were conducted to determine whether the age, parity, body condition score, weight pre- and post-partum, and height of the mare, the length of gestation and the allantochorion weight and volume were associated with foal sex ratio (n = 49), foal wet birth weight (n = 27), day 1 weight (n = 49), and foal height (n = 49). The daily growth of a subgroup of 15 foals in their first two weeks of life was monitored. In addition, age and parity data was collected via the online Thoroughbred Studbook from 492 mares that were bred to one of the Waikato Stud stallions in the 2001 breeding season.

The mean age of mares was 10.8 ± 0.8 years for the Newmarket Lodge population and 11.0 ± 0.2 years for the Waikato Stud population; the mean parity of mares was 4.5 ± 0.4 for the Newmarket Lodge population and 5.9 ± 0.2 years for the Waikato Stud population; and the mean length of gestation was 355.67 ± 1.26 days. The age and parity of the mare and the sex of the foetus had no significant effect on the length of gestation. Primiparous mares had significantly lighter and lower foals than multiparous mares, independently of the age of the mare. The mean wet birth weight of foals was 54.6 ± 1.1 kg and the mean day 1 weight was 55.7 ± 0.8 kg. The range of foal birth weights was from 41.0 to 66.5 kg. The sex of the foal did not significantly affect its wet birth weight and day 1 weight. The mean wet birth weight was 54.1 ± 2.1 for a filly, and 55.0 ± 1.3 for a colt. The mean day 1 weight was 55.2 ± 1.4 for a filly and 56.2 ± 1.1 for a colt. The relationship between the wet weight of the foal and its day 1 weight was highly significant.

Mare age and parity affected the weight and volume of the allantochorion. The allantochorions of primiparous and multiparous mares aged 16 years and over were lighter and had lower volumes than those of multiparous mares aged five to 15 years. There was no difference in the weight and volume of the allantochorions of primiparous mares and multiparous mares aged 16 years and over. The mean weight of the allantochorion was 3.68 ± 0.09 kg, and the mean volume was 2.86 ± 0.07 litres. The weight and volume of the allantochorion were significantly associated with the wet birth weight and day 1 weight of the foal. Moreover, the weight of the mare pre- and post-partum significantly affected the wet birth weight, the day 1 weight, and the height of the foal. Mares lost an average of 80.9 kg liveweight with the foaling process.

Foals lost on average 1.17 ± 0.94 kg between the wet birth weight and day 1 weight measurements. Seventy percent of foals lost weight between these measurements. The average daily weight gain of foals from day 2 to day 14 of life was 1.71 ± 0.11 kg. The average weight gain of foals was 25.05 ± 1.02 kg in the first 14 days of life. The mean height of foals at birth was 1.028 ± 0.008 m and they grew on average 0.062 ± 0.005 m to reach a mean height of 1.087 ± 0.005 m at two weeks of age. The average daily height increase from day 1 to day 14 was 0.004 ± 0.002 m. There was no significant influence of the sex of the foal on the weight gain and height increase from day 1 to day 14, although the mean wet birth weight, day 1 weight and day 14 weight of colts is slightly higher than that of fillies.

Maternal factors influence the birth size of the NZTB foal born to mares kept on pasture. The weight of the mare is closely associated with the size of the allantochorion, which is significantly associated with the birth weight of the foal. Primiparous and older mares ($\geq$ 16 years) produce smaller foals than multiparous mares younger than 16 years. Foals lose weight in the first 24 hours after birth. This early neonatal weight loss probably occurs because of drying off. The sex of the foal did not affect the length of gestation, and it did not influence the birth weight of the foal and its daily growth in the first two weeks post-partum. The information in this study has not been previously reported for horses in New Zealand.

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ABBREVIATIONS

AC	Allantochorion
cm^2	centimeter square
cm^2/cm^3	centimeter square per centimeter cubed (unit of area per unit volume)
CP	Crude protein
DE	Digestible energy
Foal day 1 weight	Foal weight on the morning after birth (within 8 to 12 hours of birth)
g/kg DM	gram of protein per kilogram of dry matter
IgG	Immunoglobulin G
IUGR	Intrauterine growth retardation
Kcal	kilocalorie
Kg	Kilogram
Kg/d	Kilogram per day
l	litre
MJ	Megajoule
MJ DE/day	Megajoule of digestible energy per day
μm^{-1}	micrometer to the power of negative one (or $\mu m^2/\mu m^3$, unit of microcotyledon surface density)
NRC	National Research Council
NZTB	New Zealand Thoroughbred
NZTR	New Zealand Thoroughbred Racing
P	pony
SEM	Standard error of the mean
TB	Thoroughbred

Wet birth weight Foal birth weight immediately after birth